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NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

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Applicant HANSEN, Arthur, P.	

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☒ in the demand filed with the International Preliminary Examining Authority on:

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2. The election ☒ was
☐ was not

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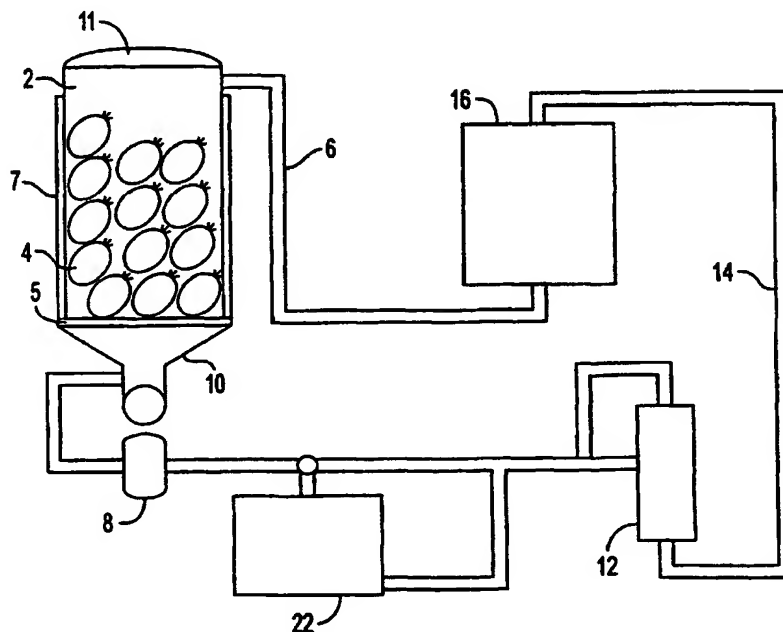
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(54) Title: **PROCESS FOR REMOVAL OF UNDESIRABLE FLAVOR FROM ENZYME-HYDROLYZED OAT BRAN AND THE RESULTING PRODUCT**



(57) Abstract: A process for removing flavor from hydrolyzed oat bran which comprises extracting the hydrolyzed oat bran with a lower alkanol until the oat bran is free of oat taste (34). The corresponding processing of soy flour is also disclosed.

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PROCESS FOR REMOVAL OF UNDESIRE
D FLAVOR FROM ENZYME-HYDROLYZED
OAT BRAN AND THE RESULTING PRODUCT

5

The present invention relates primarily to a process for the removal of undesired oat flavor from enzyme hydrolyzed oat bran and to the resulting product. The product is particularly useful as an addition to food products,
10 notably dairy products, to improve health qualities.

Background of the Invention

Enzymatically hydrolyzed oat bran products, e.g. the product "Oatrim", are well known. Such products are obtained by the process described in U.S.
15 Patent Nos. 4,996,063 and 5,082,673. Briefly, the process comprises gelatinizing a mixture of oats and water by passage through a steam injection cooker at a temperature of between 138°C to 143°C. The pH of the mixture is then adjusted and alpha-amylase enzymes are added so as to hydrolyze the starch in the mixture. After the hydrolyzation is completed, soluble fiber is
20 separated and dehydrated to give the "Oatrim" product. This can be added to dairy products, e.g. diet drinks, milk or frozen confections. Alternatively, the hydrolyzed oat bran product can be used to produce such products as cheese, yogurt, etc.

The use of "Oatrim" or the like as a food additive is extensively
25 described in the literature. See, for example, U.S. Patent Nos. 5,723,162; 5,709,900 (low fat cheese); 5,626,849 (weight loss composition); 5,607,716 (low fat confectionery items); 5,585,131 (meat products); and 5,532,018 (low fat cheese). The product is considered to be particularly useful as a heart healthy food additive in that it has been shown to provide a substantial drop in
30 artery-clogging LDL cholesterol without substantial drop in beneficial HDL cholesterol. An article by Raloff (Food Technology, 1991, Vol. 8, beginning at page 62) provides more information as to the health benefits which are realized by consuming enzymatically hydrolyzed oat bran product.

While hydrolyzed oat bran products such as "Oatrim" are described as
35 essentially taste-free, a limiting factor in the use of such products as food additives has been the fact that, as currently available, these products tend to

retain an oat taste that the public finds generally unacceptable. As a consequence, considerable research effort is being directed towards providing such products which are free from any oat taste.

5 Summary of the Invention

The principal object of the present invention is to provide a process for treating "Oatrim" or like enzymatically hydrolyzed oat bran product so as to remove undesirable oat taste while retaining other desired characteristics.

Another object is to provide improved food products, for example, milk
10 and related dairy products containing an oat-based product according to the invention which are characterized by freedom from any undesired oat taste while providing the health advantages attributable to "Oatrim" and similar products.

Broadly described, the present process comprises subjecting
15 hydrolyzed oat bran, e.g. "Oatrim", to extraction with a lower alkanol followed by removal of the alkanol. It has been found that product free from undesired oat taste and otherwise taste-free can be obtained in this way. As a consequence, the product can be added to, for example, milk or other foods to provide a product which is free of any oat taste while otherwise maintaining
20 all of the healthful characteristics of "Oatrim" or equivalent hydrolyzed oat bran product.

Description of Preferred Embodiments

For ease of reference, enzymatically hydrolyzed oat bran, such as
25 "Oatrim" made according to the aforementioned U.S. Patents 4,996,063 and 5,082,673, is generally referred to herein as "oat flour".

Preferred features of the invention are described hereinafter in conjunction with the accompanying drawings wherein:

Figure 1 represents a flow diagram illustrating a continuous extraction
30 process according to the invention;

Figure 2a diagrammatically illustrates a system for drying of the extracted oat flour and recovery of the alcohol used in the extraction;

Figure 2b is a side view of a rotary vacuum drier suitable for use in the invention;

Figure 2c is an end of the drier shown in Figure 2b;

Figure 3 diagrammatically illustrates the grinding of the oat flour which has been processed according to the invention; and

Figure 4 diagrammatically illustrates another continuous system for carrying out the process of the invention.

Referring more specifically to the drawings, the system shown in Figure 1 comprises an extraction vessel (2) of stainless steel or the equivalent in which there are placed bags (4) containing the oat flour. The bags are made of material which is of sufficiently fine mesh to retain the oat flour while open enough to permit the solvent to pass therethrough.

Advantageously, the bags rest on a stainless steel screen or grate (5) positioned above the outlet of the vessel. This facilitates removal of the solvent from the extractor as noted below.

Means, for example, a steam jacket (7), are provided for heating the contents of the vessel.

Solvent, which is preferably 95% ethanol although other lower alkanol or the equivalent can also be used, is fed to the top of the extraction vessel (2) via conduit (6). The solvent is pulled through the bags (4) within the extraction vessel by means of a Waukesha positive pump (8) or the like which is positioned at a point below the outlet (10) of the extraction vessel. The pump then forces solvent withdrawn from the extraction vessel to an ultra filtration membrane (12) or the like which removes from the solvent some of the material extracted from the oat flour. As an example, the ultra filtration membrane may be selected to remove extracted matter having a molecular weight in excess of 200, e.g. 200-400. The use of the ultra filtration membrane or equivalent is optional and this feature may be eliminated, particularly where the matter extracted from the flour has a molecular weight below 200.

The solvent then leaves the ultra filtration membrane (12), if used, via conduit (14) for a charcoal filter (16) or the like to remove any color and/or flavor substances with a molecular weight of less than 200. The thus processed solvent may then be passed via (6) back to the extraction vessel (2). Makeup solvent, if needed, can also be added at this stage or at some other convenient point in the system.

Preferably, at least some, and possibly all, of the solvent withdrawn from the extraction vessel is passed into a chiller (22) where the solvent is cooled to crystallize and remove fats or lipids extracted from the oat flour. A temperature in the range of 34°F to 40°F, preferably about 36°F, may be employed for the chiller. Usually, the solvent will be kept in the chiller for 1 to 2 hours to enable removal of the fats or lipids in crystal form.

Overall, the extraction process as shown in Figure 1 may be completed in about 20-24 hours, with solvent preferably being continuously circulated through the system. In an alternative arrangement, the process may be carried out batch-wise. In such case, the oat flour is allowed to stand in extraction vessel (2) steeped in solvent which is periodically withdrawn and replaced every 8 hours with fresh solvent. Whether carried out continuously or batch-wise, the solvent used for the extraction is advantageously processed for further use as described above by, for example, chilling to remove fats and passage through suitable filter means or by distillation to remove color and flavor substances and/or other contaminants before the solvent is re-used.

The extraction is preferably carried out at elevated temperature and pressure. Temperatures in the range of 140°F to 160°F and pressures of about 3 to 7 psig are preferred. However, other temperatures and pressures may be used.

Residence time in the extraction vessel will vary depending on other conditions, e.g. the amount of oat flour being processed, whether or not the process is carried out continuously or batch-wise, etc. Usually, however, a total time of 20-24 hours contact time between the oat flour and solvent is sufficient for the extraction. For batch operations, several extraction cycles of, for example, 8 hours each can be employed as earlier noted. Usually three such cycles are sufficient to provide the desired taste-free product. In continuous operations, the solvent can be continuously fed into the vessel and removed therefrom, the process being continued until the oat flour is taste-free.

Following the extraction with alkanol, the processed oat flour must be dried to remove all of the alcohol. This may be done in various ways, e.g. by allowing the oat flour to dry in air and/or by placing the oat flour in a heated

drier such as a vacuum drier, operable at a temperature (e.g. 120 - 130°F) sufficient to volatilize the alkanol without damaging the oat flour.

Figures 2a -2c illustrate one way of drying of the oat flour after extraction. As shown, the oat flour, after the extraction, is placed in a rotary vacuum drier (24) or the equivalent where much of the alcohol solvent (e.g. up to 99% or more) is recovered. In the embodiment shown, the drier, which may be in the form of a rotatable screened drum, is positioned within a sealed vessel (25) or the like so that the alcohol, as it is evaporated in the rotary vacuum drier, passes via an appropriate conduit (26) into a chilled condenser (28) where the alcohol is condensed. This alcohol can then be fed into an appropriate storage tank (30) for later use or, if desired, the condensed alcohol can be fed directly to the extraction vessel for use.

As schematically shown in Figures 2b and 2c, the vacuum drum (24) is rotatable about a horizontal axis (27) which is itself rotatable on supports (29), the volatilized alcohol escaping from the drum through small screen openings (31).

The solvent-free oat flour is then further processed in, for example, a stainless steel Fitzmill grinder (34) as shown in Figure 3 to provide a desired particle size, e.g. 20-80 mesh. The ground product is then placed into suitable containers, e.g. polyethylene bags, which should be heat sealed. The packaged product is ready for incorporation into, for example, dairy foods, nutritional drinks or frozen desserts, to provide the health advantages of "Oatrim" or the like but without any oat flavor.

The invention is further described by reference to the following examples:

Example 1

Fresh "Oatrim" (oat flour) was placed in eight sterile muslin bags (4), using 30 pounds per bag. The bags were tied off with colorless twine. The bags were then placed in a clean stainless steel pressurized-jacketed extractor (2). The bags were positioned on a stainless steel screen or grate (5) a distance, e.g. 18 inches, above the drain line or outlet (10). This made it possible to pump the extractant (95% ethanol) out of the vessel without blocking the suction side of the pump (8).

After the eight bags were placed in the extractor, a gasket around the open top of the extractor (not shown) was lubricated and a lid (11) was placed over the extractor top, closed and sealed. Cap bolts (not shown) were tightened across from each other to tighten the lid evenly.

5 Steam was then turned on to heat the jacketed extractor (2) to 160°F and the pump (8) was turned on to begin circulating the alcohol over the oat flour. The hot alcohol was pulled through the bags of oat flour to remove the oat flavor and color. This extraction was continued for 12 hours under heat of 160°F and pressure (6 psi). After 12 hours, the heat was shut off along with
10 the pump and the mixture was allowed to cool to room temperature (70°F).

The next day, the top of the extractor (2) was opened to allow air in so that the alcohol extract could be pumped into a collection drum or drums. Approximately 75 gallons of ethanol (95%) were pumped into the extraction with a yield of 45 to 50 gallons pumped out after 24 hours. This difference
15 between the amount of alcohol fed in and taken out was due to the 240 pounds of "Oatrim" absorbing 25 to 30 gallons of ethanol. The above extraction was repeated two further times. The second extraction only used approximately 55 gallons of ethanol (95%). This was pumped into the extractor and the extractor lid was sealed and heat turned on to 160°F as
20 before. The positive pump (8) was started and the hot alcohol was circulated over the bags of "Oatrim" to remove oat flavor. The alcohol was circulated for 12 hours at 160°F under pressure (6 psi). After the 12 hours, the extractor was shut off and allowed to cool overnight to room temperature. The lid was then opened and the alcohol extract was again pumped into collection drums.

25 For the third and final extraction, 55 gallons fresh ethanol (95%) were pumped into the extractor (2), the lid was closed and the alcohol heated to 160°F. The ethanol was circulated through the oat flour for another 12 hours. The extractor was then shut off and allowed to cool down to room temperature. The next day, the extractor lid was opened and the alcohol was
30 pumped out into the collection drum. The bags of extracted "Oatrim" were then removed from the extractor and placed in stainless steel pans to air dry. The extracted product was stirred three to four times per day to accelerate the drying. The final drying was done in a convection oven at 130°F to prevent

any chemical alteration to the product due to Malliard Reaction or protein denaturation. Once the mixture was totally dried of the ethanol, the product was ground to eighty mesh in a stainless steel Fitzmill grinder (34) as shown in Figure 3. The product, which was free of taste and odor, was then
5 packaged in multi-layered polyethylene bags for use in the fortification of fat-free milk and chocolate milk.

Example 2

10 Two hundred and forty pounds oat flour ("Oatrim") was extracted with seventy-five gallons of 95 % ethanol for twelve hours at 140-160°F. This was followed by a second extraction using sixty gallons of 95 % ethanol for twelve hours at the same temperature. A third extraction then followed using sixty gallons of fresh ethanol and extracting for twelve hours at 140-160°F. The
15 extracts contained color and oat flavor. The color of the first extract was similar to weak tea whereas the second extraction was lighter and the third similar to off-colored water.

Coconut charcoal was ground up to be granular packed in a glass column with glass wool on the top and bottom of the charcoal bed. The oat
20 extract from each extraction was passed through the coconut charcoal at a slow rate. This removed all of the color and the flavor from the ethanol rendering it colorless and free of oat flavor. This process was repeated on each extract from the first, second and third extractions. To further test the viability of using the charcoal to clean up the ethanol for further use, a gallon of
25 the first extraction was concentrated from one gallon to sixteen ounces and this concentrate was then passed through a fresh coconut charcoal filter with the same results, i.e. the filtered ethanol was colorless and flavorless as related to oat flavor.

Example 3

30 Further testing was done on a commercial scale using a stainless steel housing with a charcoal filter placed in the housing. For this purpose, the oat flour was put in muslin bags tied with nylon rope and placed in the extractor as shown in Figure 4. Seventy-five gallons of ninety-five 95 % ethanol were

then pumped on top of the oat flour. The lid of the extractor was greased and sealed with the nuts cranked down on the opposite sides until completely sealed. The ethanol was heated to 140-160°F and circulated with a Waukesha pump (8) through the charcoal filter 35 and into the extractor (2) as shown in Figure 4. The extractor was run for eight hours continuously. After the eight hour run, the extractor was shut down, allowed to cool overnight and a sample of the oat flour was removed and analyzed in skim milk for oat flavor. There was a slight oat flavor in the milk. The extractor was then run continuously for another eight hours and a sample of oat flour randomly removed from one of the oat flour bags in the extractor. The sample was dried, sifted and placed in skim milk and tested for oat flavor. At this time, eight hours to be certain that all of the oat flavor was totally removed from the oat flour. The sample was dried, sifted and placed in skim milk for flavor evaluation. There was no oat flavor remaining in the oats.

This example indicates that in the arrangement shown in Figure 4 using a charcoal filter, the oat flour can be effectively processed in twenty-four hours to remove all of the oat flavor while allowing the same alcohol to be used over and over again throughout the process. This has the dual advantage of reducing the overall time involved in processing the oat flour into a taste-free state while at the same time reducing the loss of alcohol which would otherwise occur. Charcoal filters appear to be particularly useful for this purpose as ultra filtration membranes or millipore filters do not appear to be as effective, particularly with respect to removing extracted matter at the 200 – 400 molecular weight level.

It will be appreciated that various modifications may be made above. Thus, while the invention has been illustrated above by reference to the processing of "Oatrim", it will be recognized that the invention is broadly useful towards improving the characteristics of other types of oat flour products made by enzymatically hydrolyzing oat bran or the like. Furthermore, while the invention has been described in the foregoing with respect to the processing of oat flour, it is contemplated that the invention can also be used to remove undesirable flavors from soy flour and the like by use of the process described herein.

Accordingly, the scope of the invention is set out in the following claims wherein:

I claim:

1. A process for removing oat flavor from oat flour which comprises extracting the oat flour with a lower alkanol until the oat flour is free of oat flavor.
2. The process of claim 1 wherein the lower alkanol is ethanol.
3. The process of claim 2 wherein the extraction is carried out at elevated temperature and pressure.
4. The process of claim 1 wherein the oat flour after extraction is vacuum dried to remove any traces of the lower alkanol.
5. The process of claim 1 carried out continuously.
6. The process of claim 1 carried out batch-wise.
7. The process of claim 1 wherein the alkanol, after extracting the oat flour, is processed to remove lipids, filtered to remove any color and flavor compounds extracted from the oat flour and then recycled for further extraction of the oat flour.
8. The process of claim 1 wherein the extraction with lower alkanol is carried out for 20-24 hours at elevated temperature and pressure.
9. The process of claim 1 wherein the oat flour is "Oatrim".
10. The product obtained by the process of claim 1.
11. A process for removing soy flavor from soy flour which comprises extracting the soy flour with a lower alkanol until the soy flour is free of soy flavor.

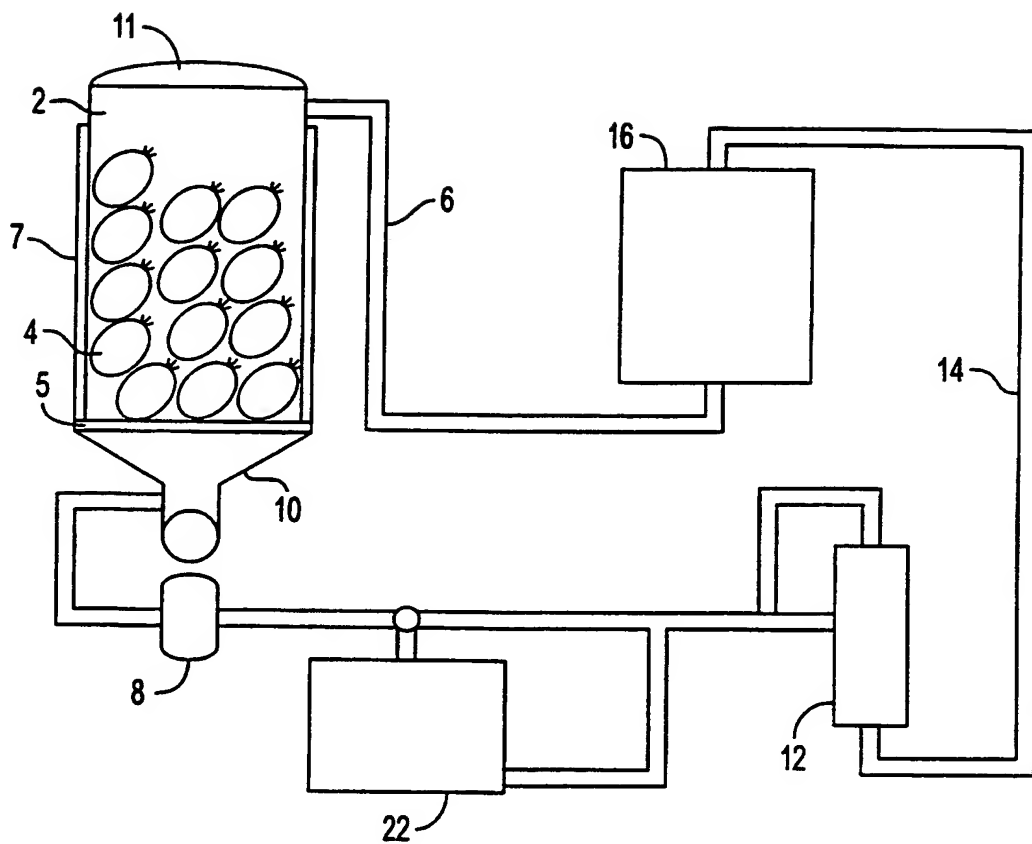


FIG. 1

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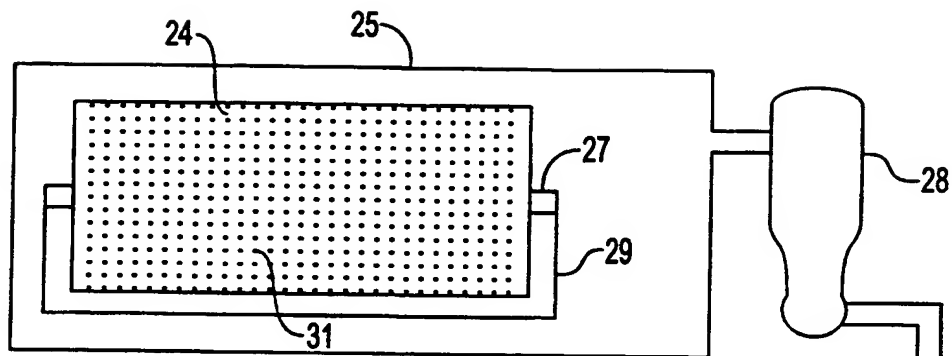


FIG. 2A

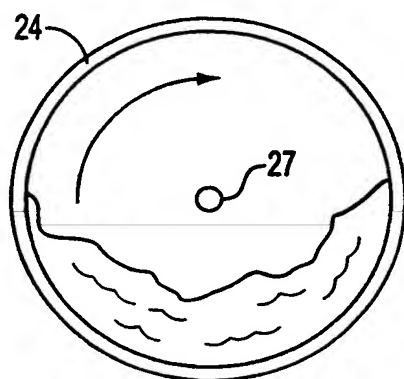


FIG. 2C

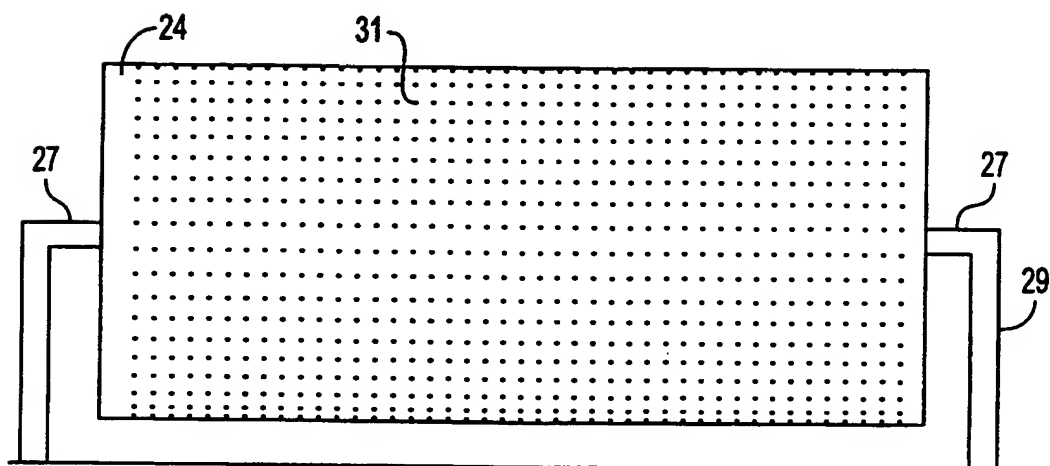


FIG. 2B

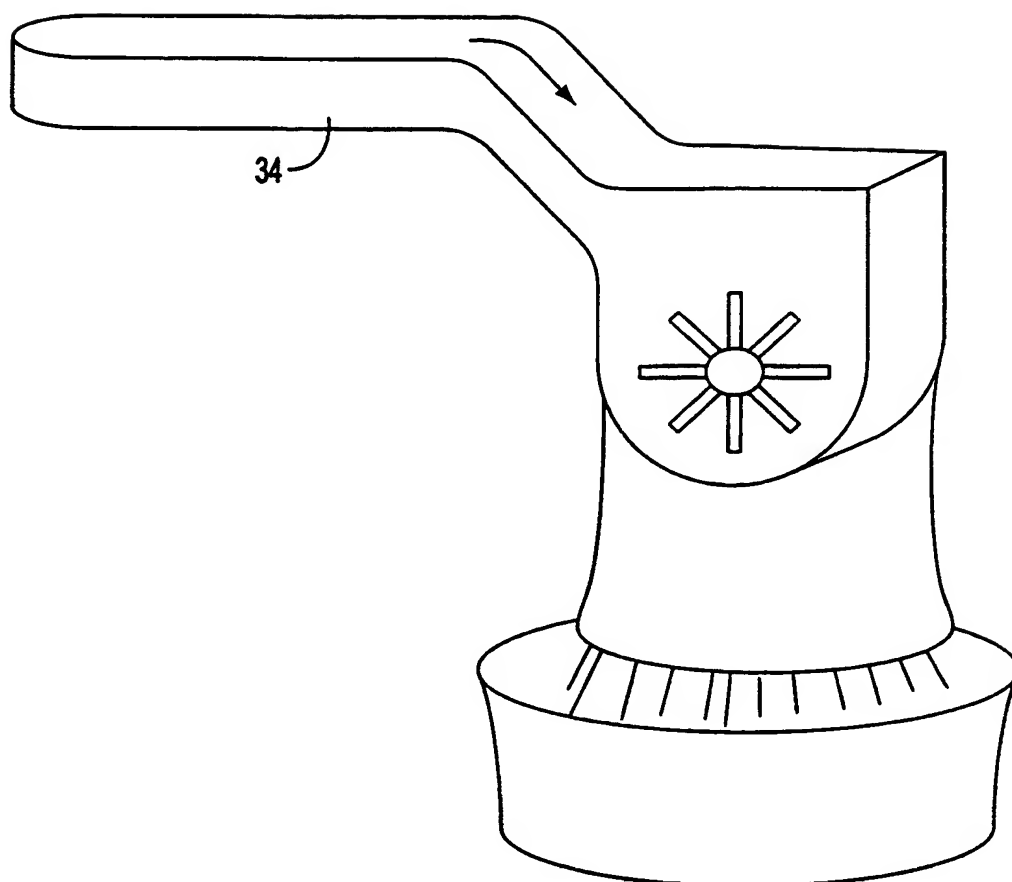


FIG. 3

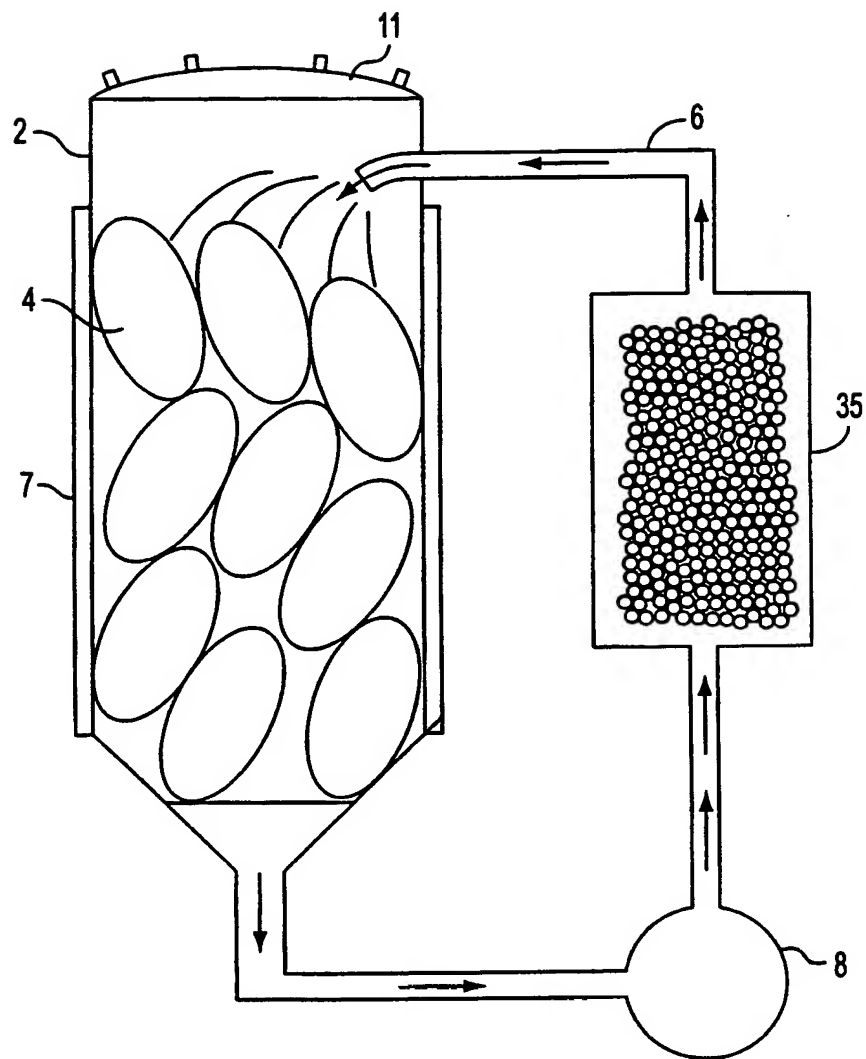


FIG. 4

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A23B 5/12, 5/14, 5/18; A23L 1/015

US CL : 426/429, 430, 622

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/429, 430, 622

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST search terms: oats, bran, enzymatic, taste, flavor, flour, alcohol, vacuum

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,168,406 A (MOSHY) 02 February 1965, col. 2, lines 63-75, col. 3, lines 1-30.	11
Y	US 2,146,958 A (KOTERA) 14 February 1949, col. 1, lines 1-10, col. 2, lines 36-47,	7
X	US 4,211,801 A (OUGHTON) 08 July 1980, abstract and col. 6, lines 20-54.	1, 2
Y		3-6, 8, 10
P, Y	US 6,113,908 A (PATON et al.) 05 September 2000, abstract and col. 18, lines 55-65, col. 20, 1-7.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

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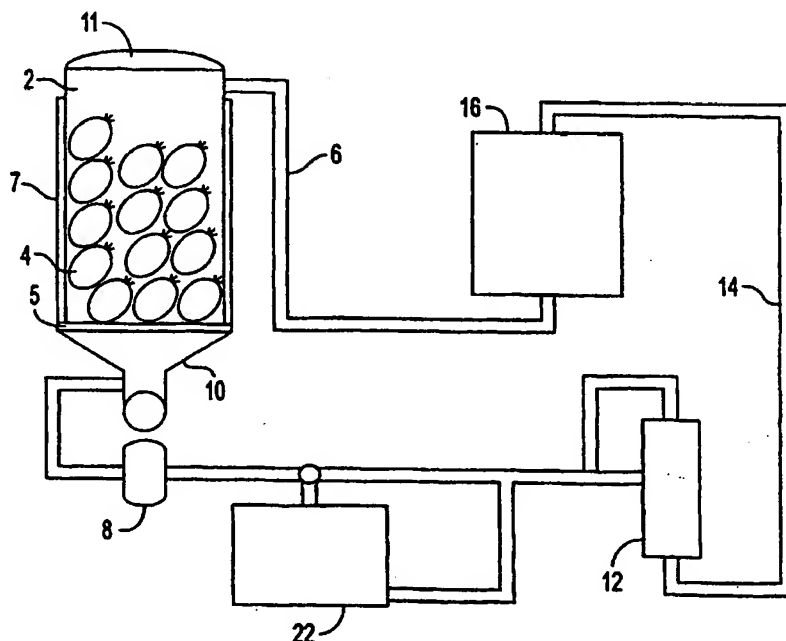
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Background of the Invention

Enzymatically hydrolyzed oat bran products, e.g. the product "Oatrim", are well known. Such products are obtained by the process described in U.S. Patent Nos. 4,996,063 and 5,082,673. Briefly, the process comprises gelatinizing a mixture of oats and water by passage through a steam injection cooker at a temperature of between 138°C to 143°C. The pH of the mixture is then adjusted and alpha-amylase enzymes are added so as to hydrolyze the starch in the mixture. After the hydrolyzation is completed, soluble fiber is separated and dehydrated to give the "Oatrim" product. This can be added to dairy products, e.g. diet drinks, milk or frozen confections. Alternatively, the hydrolyzed oat bran product can be used to produce such products as cheese, yogurt, etc.

The use of "Oatrim" or the like as a food additive is extensively described in the literature. See, for example, U.S. Patent Nos. 5,723,162; 5,709,900 (low fat cheese); 5,626,849 (weight loss composition); 5,607,716 (low fat confectionery items); 5,585,131 (meat products); and 5,532,018 (low fat cheese). The product is considered to be particularly useful as a heart healthy food additive in that it has been shown to provide a substantial drop in artery-clogging LDL cholesterol without substantial drop in beneficial HDL cholesterol. An article by Raloff (Food Technology, 1991, Vol. 8, beginning at page 62) provides more information as to the health benefits which are realized by consuming enzymatically hydrolyzed oat bran product.

While hydrolyzed oat bran products such as "Oatrim" are described as essentially taste-free, a limiting factor in the use of such products as food additives has been the fact that, as currently available, these products tend to

retain an oat taste that the public finds generally unacceptable. As a consequence, considerable research effort is being directed towards providing such products which are free from any oat taste.

5 Summary of the Invention

The principal object of the present invention is to provide a process for treating "Oatrim" or like enzymatically hydrolyzed oat bran product so as to remove undesirable oat taste while retaining other desired characteristics.

10 Another object is to provide improved food products, for example, milk and related dairy products containing an oat-based product according to the invention which are characterized by freedom from any undesired oat taste while providing the health advantages attributable to "Oatrim" and similar products.

15 Broadly described, the present process comprises subjecting hydrolyzed oat bran, e.g. "Oatrim", to extraction with a lower alkanol followed by removal of the alkanol. It has been found that product free from undesired oat taste and otherwise taste-free can be obtained in this way. As a consequence, the product can be added to, for example, milk or other foods to provide a product which is free of any oat taste while otherwise maintaining
20 all of the healthful characteristics of "Oatrim" or equivalent hydrolyzed oat bran product.

Description of Preferred Embodiments

25 For ease of reference, enzymatically hydrolyzed oat bran, such as "Oatrim" made according to the aforementioned U.S. Patents 4,996,063 and 5,082,673, is generally referred to herein as "oat flour".

Preferred features of the invention are described hereinafter in conjunction with the accompanying drawings wherein:

30 Figure 1 represents a flow diagram illustrating a continuous extraction process according to the invention;

Figure 2a diagrammatically illustrates a system for drying of the extracted oat flour and recovery of the alcohol used in the extraction;

Figure 2b is a side view of a rotary vacuum drier suitable for use in the invention;

Figure 2c is an end of the drier shown in Figure 2b;

Figure 3 diagrammatically illustrates the grinding of the oat flour which has been processed according to the invention; and

Figure 4 diagrammatically illustrates another continuous system for
5 carrying out the process of the invention.

Referring more specifically to the drawings, the system shown in Figure 1 comprises an extraction vessel (2) of stainless steel or the equivalent in which there are placed bags (4) containing the oat flour. The bags are made of material which is of sufficiently fine mesh to retain the oat flour while open
10 enough to permit the solvent to pass therethrough.

Advantageously, the bags rest on a stainless steel screen or grate (5) positioned above the outlet of the vessel. This facilitates removal of the solvent from the extractor as noted below.

Means, for example, a steam jacket (7), are provided for heating the
15 contents of the vessel.

Solvent, which is preferably 95% ethanol although other lower alkanol or the equivalent can also be used, is fed to the top of the extraction vessel (2) via conduit (6). The solvent is pulled through the bags (4) within the extraction vessel by means of a Waukesha positive pump (8) or the like which
20 is positioned at a point below the outlet (10) of the extraction vessel. The pump then forces solvent withdrawn from the extraction vessel to an ultra filtration membrane (12) or the like which removes from the solvent some of the material extracted from the oat flour. As an example, the ultra filtration membrane may be selected to remove extracted matter having a molecular
25 weight in excess of 200, e.g. 200-400. The use of the ultra filtration membrane or equivalent is optional and this feature may be eliminated, particularly where the matter extracted from the flour has a molecular weight below 200.

The solvent then leaves the ultra filtration membrane (12), if used, via
30 conduit (14) for a charcoal filter (16) or the like to remove any color and/or flavor substances with a molecular weight of less than 200. The thus processed solvent may then be passed via (6) back to the extraction vessel (2). Makeup solvent, if needed, can also be added at this stage or at some other convenient point in the system.

Preferably, at least some, and possibly all, of the solvent withdrawn from the extraction vessel is passed into a chiller (22) where the solvent is cooled to crystallize and remove fats or lipids extracted from the oat flour. A temperature in the range of 34°F to 40°F, preferably about 36°F, may be employed for the chiller. Usually, the solvent will be kept in the chiller for 1 to 2 hours to enable removal of the fats or lipids in crystal form.

Overall, the extraction process as shown in Figure 1 may be completed in about 20-24 hours, with solvent preferably being continuously circulated through the system. In an alternative arrangement, the process may be carried out batch-wise. In such case, the oat flour is allowed to stand in extraction vessel (2) steeped in solvent which is periodically withdrawn and replaced every 8 hours with fresh solvent. Whether carried out continuously or batch-wise, the solvent used for the extraction is advantageously processed for further use as described above by, for example, chilling to remove fats and passage through suitable filter means or by distillation to remove color and flavor substances and/or other contaminants before the solvent is re-used.

The extraction is preferably carried out at elevated temperature and pressure. Temperatures in the range of 140°F to 160°F and pressures of about 3 to 7 psig are preferred. However, other temperatures and pressures may be used.

Residence time in the extraction vessel will vary depending on other conditions, e.g. the amount of oat flour being processed, whether or not the process is carried out continuously or batch-wise, etc. Usually, however, a total time of 20-24 hours contact time between the oat flour and solvent is sufficient for the extraction. For batch operations, several extraction cycles of, for example, 8 hours each can be employed as earlier noted. Usually three such cycles are sufficient to provide the desired taste-free product. In continuous operations, the solvent can be continuously fed into the vessel and removed therefrom, the process being continued until the oat flour is taste-free.

Following the extraction with alkanol, the processed oat flour must be dried to remove all of the alcohol. This may be done in various ways, e.g. by allowing the oat flour to dry in air and/or by placing the oat flour in a heated

drier such as a vacuum drier, operable at a temperature (e.g. 120 - 130°F) sufficient to volatilize the alkanol without damaging the oat flour.

Figures 2a -2c illustrate one way of drying of the oat flour after extraction. As shown, the oat flour, after the extraction, is placed in a rotary vacuum drier (24) or the equivalent where much of the alcohol solvent (e.g. up to 99% or more) is recovered. In the embodiment shown, the drier, which may be in the form of a rotatable screened drum, is positioned within a sealed vessel (25) or the like so that the alcohol, as it is evaporated in the rotary vacuum drier, passes via an appropriate conduit (26) into a chilled condenser (28) where the alcohol is condensed. This alcohol can then be fed into an appropriate storage tank (30) for later use or, if desired, the condensed alcohol can be fed directly to the extraction vessel for use.

As schematically shown in Figures 2b and 2c, the vacuum drum (24) is rotatable about a horizontal axis (27) which is itself rotatable on supports (29), the volatilized alcohol escaping from the drum through small screen openings (31).

The solvent-free oat flour is then further processed in, for example, a stainless steel Fitzmill grinder (34) as shown in Figure 3 to provide a desired particle size, e.g. 20-80 mesh. The ground product is then placed into suitable containers, e.g. polyethylene bags, which should be heat sealed. The packaged product is ready for incorporation into, for example, dairy foods, nutritional drinks or frozen desserts, to provide the health advantages of "Oatrim" or the like but without any oat flavor.

The invention is further described by reference to the following examples:

Example 1

Fresh "Oatrim" (oat flour) was placed in eight sterile muslin bags (4), using 30 pounds per bag. The bags were tied off with colorless twine. The bags were then placed in a clean stainless steel pressurized-jacketed extractor (2). The bags were positioned on a stainless steel screen or grate (5) a distance, e.g. 18 inches, above the drain line or outlet (10). This made it possible to pump the extractant (95% ethanol) out of the vessel without blocking the suction side of the pump (8).

After the eight bags were placed in the extractor, a gasket around the open top of the extractor (not shown) was lubricated and a lid (11) was placed over the extractor top, closed and sealed. Cap bolts (not shown) were tightened across from each other to tighten the lid evenly.

5 Steam was then turned on to heat the jacketed extractor (2) to 160°F and the pump (8) was turned on to begin circulating the alcohol over the oat flour. The hot alcohol was pulled through the bags of oat flour to remove the oat flavor and color. This extraction was continued for 12 hours under heat of 160°F and pressure (6 psi). After 12 hours, the heat was shut off along with
10 the pump and the mixture was allowed to cool to room temperature (70°F).

 The next day, the top of the extractor (2) was opened to allow air in so that the alcohol extract could be pumped into a collection drum or drums. Approximately 75 gallons of ethanol (95%) were pumped into the extraction with a yield of 45 to 50 gallons pumped out after 24 hours. This difference
15 between the amount of alcohol fed in and taken out was due to the 240 pounds of "Oatrim" absorbing 25 to 30 gallons of ethanol. The above extraction was repeated two further times. The second extraction only used approximately 55 gallons of ethanol (95%). This was pumped into the
20 extractor and the extractor lid was sealed and heat turned on to 160°F as before. The positive pump (8) was started and the hot alcohol was circulated over the bags of "Oatrim" to remove oat flavor. The alcohol was circulated for 12 hours at 160°F under pressure (6 psi). After the 12 hours, the extractor was shut off and allowed to cool overnight to room temperature. The lid was then opened and the alcohol extract was again pumped into collection drums.

25 For the third and final extraction, 55 gallons fresh ethanol (95%) were pumped into the extractor (2), the lid was closed and the alcohol heated to 160°F. The ethanol was circulated through the oat flour for another 12 hours. The extractor was then shut off and allowed to cool down to room temperature. The next day, the extractor lid was opened and the alcohol was
30 pumped out into the collection drum. The bags of extracted "Oatrim" were then removed from the extractor and placed in stainless steel pans to air dry. The extracted product was stirred three to four times per day to accelerate the drying. The final drying was done in a convection oven at 130°F to prevent

any chemical alteration to the product due to Malliard Reaction or protein denaturation. Once the mixture was totally dried of the ethanol, the product was ground to eighty mesh in a stainless steel Fitzmill grinder (34) as shown in Figure 3. The product, which was free of taste and odor, was then
5 packaged in multi-layered polyethylene bags for use in the fortification of fat-free milk and chocolate milk.

Example 2

10 Two hundred and forty pounds oat flour ("Oatrim") was extracted with seventy-five gallons of 95 % ethanol for twelve hours at 140-160°F. This was followed by a second extraction using sixty gallons of 95 % ethanol for twelve hours at the same temperature. A third extraction then followed using sixty gallons of fresh ethanol and extracting for twelve hours at 140-160°F. The
15 extracts contained color and oat flavor. The color of the first extract was similar to weak tea whereas the second extraction was lighter and the third similar to off-colored water.

Coconut charcoal was ground up to be granular packed in a glass column with glass wool on the top and bottom of the charcoal bed. The oat
20 extract from each extraction was passed through the coconut charcoal at a slow rate. This removed all of the color and the flavor from the ethanol rendering it colorless and free of oat flavor. This process was repeated on each extract from the first, second and third extractions. To further test the viability of using the charcoal to clean up the ethanol for further use, a gallon of
25 the first extraction was concentrated from one gallon to sixteen ounces and this concentrate was then passed through a fresh coconut charcoal filter with the same results, i.e. the filtered ethanol was colorless and flavorless as related to oat flavor.

Example 3

30 Further testing was done on a commercial scale using a stainless steel housing with a charcoal filter placed in the housing. For this purpose, the oat flour was put in muslin bags tied with nylon rope and placed in the extractor as shown in Figure 4. Seventy-five gallons of ninety-five 95 % ethanol were

then pumped on top of the oat flour. The lid of the extractor was greased and sealed with the nuts cranked down on the opposite sides until completely sealed. The ethanol was heated to 140-160°F and circulated with a Waukesha pump (8) through the charcoal filter 35 and into the extractor (2) as shown in Figure 4. The extractor was run for eight hours continuously. After the eight hour run, the extractor was shut down, allowed to cool overnight and a sample of the oat flour was removed and analyzed in skim milk for oat flavor. There was a slight oat flavor in the milk. The extractor was then run continuously for another eight hours and a sample of oat flour randomly removed from one of the oat flour bags in the extractor. The sample was dried, sifted and placed in skim milk and tested for oat flavor. At this time, eight hours to be certain that all of the oat flavor was totally removed from the oat flour. The sample was dried, sifted and placed in skim milk for flavor evaluation. There was no oat flavor remaining in the oats.

This example indicates that in the arrangement shown in Figure 4 using a charcoal filter, the oat flour can be effectively processed in twenty-four hours to remove all of the oat flavor while allowing the same alcohol to be used over and over again throughout the process. This has the dual advantage of reducing the overall time involved in processing the oat flour into a taste-free state while at the same time reducing the loss of alcohol which would otherwise occur. Charcoal filters appear to be particularly useful for this purpose as ultra filtration membranes or millipore filters do not appear to be as effective, particularly with respect to removing extracted matter at the 200 – 400 molecular weight level.

It will be appreciated that various modifications may be made above. Thus, while the invention has been illustrated above by reference to the processing of "Oatrim", it will be recognized that the invention is broadly useful towards improving the characteristics of other types of oat flour products made by enzymatically hydrolyzing oat bran or the like. Furthermore, while the invention has been described in the foregoing with respect to the processing of oat flour, it is contemplated that the invention can also be used to remove undesirable flavors from soy flour and the like by use of the process described herein.

Accordingly, the scope of the invention is set out in the following claims wherein:

I claim:

1. A process for removing oat flavor from oat flour which comprises extracting the oat flour with a lower alkanol until the oat flour is free of oat flavor.
2. The process of claim 1 wherein the lower alkanol is ethanol.
3. The process of claim 2 wherein the extraction is carried out at elevated temperature and pressure.
4. The process of claim 1 wherein the oat flour after extraction is vacuum dried to remove any traces of the lower alkanol.
5. The process of claim 1 carried out continuously.
6. The process of claim 1 carried out batch-wise.
7. The process of claim 1 wherein the alkanol, after extracting the oat flour, is processed to remove lipids, filtered to remove any color and flavor compounds extracted from the oat flour and then recycled for further extraction of the oat flour.
8. The process of claim 1 wherein the extraction with lower alkanol is carried out for 20-24 hours at elevated temperature and pressure.
9. The process of claim 1 wherein the oat flour is "Oatrim".
10. The product obtained by the process of claim 1.
11. A process for removing soy flavor from soy flour which comprises extracting the soy flour with a lower alkanol until the soy flour is free of soy flavor.

PATENT COOPERATION TREATY

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REC'D 07 JAN 2002

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 243453 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/20781	International filing date (day/month/year) 16 AUGUST 2000	Priority date (day/month/year) 17 AUGUST 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): A23L 1/015, 1/10, 1/20 and US Cl.: 426/429, 430, 622		
Applicant ARTHUR P. HANSEN		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets.

☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 16 MARCH 2001	Date of completion of this report 13 DECEMBER 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer HELEN F. PRATT <i>Helen Pratt</i>
Facsimile No. (703) 305-3230	Telephone No. (703) 308-1193

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/20781

I. Basis of the report

1. With regard to the elements of the international application: *

☒ the international application as originally filed☒ the description:pages 1-9, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of _____☒ the claims:pages 10, as originally filedpages NONE, as amended (together with any statement) under Article 19pages NONE, filed with the demandpages NONE, filed with the letter of _____☒ the drawings:pages 1-4, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of _____☒ the sequence listing part of the description:pages NONE, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of _____

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☒ The amendments have resulted in the cancellation of:☒ the description, pages none☒ the claims, Nos. none☒ the drawings, sheets/fig none5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/20781

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)

Claims 1-10

YES

Claims 11

NO

Inventive Step (IS)

Claims none

YES

Claims 1-11

NO

Industrial Applicability (IA)

Claims 1-11

YES

Claims NONE

NO

2. citations and explanations (Rule 70.7)

Claims 1-10 lack an inventive step under PCT Article 33(3) as being obvious over Oughton in view of Moshy.

Oughton discloses a process of treating ground oats with a lower alkanol which can be ethanol (abstract and col. 2, lines 60-70, col. 6, lines 20-54). Claims 1 and 2 differ from the reference in removing the flavors from the oats and in the starting product which is ground oats instead of flour. As the process has been shown, it is seen that the flavor of oats is also removed. Moshy discloses removing flavors from soybean flour using alcohol (col. 4, lines 30-75). No distinction is seen at this time in the use of ground oats instead of flour, as the only difference is in the size of the extracted material. Therefore, it would have been obvious to use the process of Moshy to remove flavors in the instant process because Moshy discloses that alcohol removes flavors and it would also have been obvious to use a more finely ground oat such as flour as the size of the particles is only a matter of degree.

Claim 3 requires the use of elevated temperature and pressures and claim 8 that the extraction is for 20-24 hours. Moshy discloses a process for removing undesirable flavors and odors by the extracting soybeans with ethanol at temperatures of from 75 F. -175 F. (col. 7, lines 40-45, lines 65-70). It would have been obvious to extract for whatever time was required to remove the flavors as in claim 8. It is known that higher extraction temperatures cause the alcohol to become volatile. Certainly, the ethanol will remove flavors whatever the substrate is. Therefore, it would have been obvious to use higher temperatures to remove flavors.

Claim 4 further requires that the flour is vacuum dried. Oughton discloses that the centrifuged flour is dried under a vacuum which would remove any alcohol (col. 6, lines 41-44). Therefore, it would have been obvious to remove alcohol from a material using a vacuum.

Claims 5 and 6 further require that the process is carried out (Continued on Supplemental Sheet.)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/20781

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 8 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because the claim is indefinite for the following reason(s): it is not known what is meant by "elevated temperature and pressure", i. e. how much are the temperatures and pressures elevated from the normal temperatures and pressures.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/20781

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):
continuously or batchwise. The process of Oughton can be used in either a continuous or in a batchwise manner (col. 7, lines 10-35). Therefore, it would have been obvious to process in either manner.

Claim 7 requires that the lipids are removed from the product, filtered and that the alkanol is recycled. Oughton discloses that the lipids (fats) are removed using alcohol (col. 2, lines 54-70).

Claim 9 further requires that the oat flour is "OATRIM". "Oatrim" is a trade name for a particular oat flour. No difference is seen at this time in the use of that flour and the finely divided oats of the reference to Oughton. Therefore, it would have been obvious to use various flours such as "Oatrim", as the removal of the flavors would have been made possible on similar substrates.

Claim 10 is to the product which have been shown to be obvious by the combined references.

Claim 11 lacks novelty under PCT Article 33(2) as being anticipated by Moshy.

Claim 11 requires removing flavors from a soy flour. Moshy discloses removing flavors from soybean flour using a lower alkanol (col. 3, lines 20-35 until the flour is bland).

Claims 1-11 meet the requirements for industrial applicability as defined by PCT Article 33(4) in providing a product and process of removing flavors from oat flour and soybean flour.

----- NEW CITATIONS -----
NONE

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/20781

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : A23B 5/12, 5/14, 5/18; A23L 1/015

US CL : 426/429, 430, 622

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 426/429, 430, 622

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WEST search terms: oats, bran, enzymatic, taste, flavor, flour, alcohol, vacuum

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 3,168,406 A (MOSHY) 02 February 1965, col. 2, lines 63-75, col. 3, lines 1-30.	11
Y	US 2,146,958 A (KOTERA) 14 February 1949, col. 1, lines 1-10, col. 2, lines 36-47,	7
X	US 4,211,801 A (OUGHTON) 08 July 1980, abstract and col. 6, lines 20-54.	1, 2
<u>Y</u>		<u>3-6, 8, 10</u>
P, Y	US 6,113,908 A (PATON et al.) 05 September 2000, abstract and col. 18, lines 55-65, col. 20, 1-7.	1-10

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	*T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
A document defining the general state of the art which is not considered to be of particular relevance	*X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
E earlier document published on or after the international filing date	*Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
L document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	*Z* document member of the same patent family
O document referring to an oral disclosure, use, exhibition or other means	
P document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

07 NOVEMBER 2000

Date of mailing of the international search report

28 NOV 2000

Name and mailing address of the ISA/US
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PATENT COOPERATION TREATY

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NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

KOKULIS, Paul, N.
Pillsbury Madison & Sutro LLP
1100 New York Avenue, NW
Washington, DC 20005
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 22 November 2000 (22.11.00)			
Applicant's or agent's file reference 243453 PCT	IMPORTANT NOTIFICATION		
International application No. PCT/US00/20781	International filing date (day/month/year) 16 August 2000 (16.08.00)		
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 17 August 1999 (17.08.99)		
Applicant HANSEN, Arthur, P.			

1. The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
3. An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
4. The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed** to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
17 Augu 1999 (17.08.99)	60/149,246	US	20 Nove 2000 (20.11.00)

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PATENT COOPERATION TREATY

WO 01/11976
PCT/US00/20781

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

KOKULIS, Paul, N.
Pillsbury Madison & Sutro LLP
1100 New York Avenue, NW
Washington, DC 20005
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 22 February 2001 (22.02.01)		
Applicant's or agent's file reference 243453 PCT		IMPORTANT NOTICE
International application No. PCT/US00/20781	International filing date (day/month/year) 16 August 2000 (16.08.00)	Priority date (day/month/year) 17 August 1999 (17.08.99)
Applicant HANSEN, Arthur, P.		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU, KP, KR, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE, AG, AL, AM, AP, AT, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EA, EE, EP, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, OA, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, UZ, VN, YU.
 The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on 22 February 2001 (22.02.01) under No. WO 01/11976

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a **demand for international preliminary examination** must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the **national phase**, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer <div style="text-align: right;">J. Zahra</div>
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 243453 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/20781	International filing date (day/month/year) 16 AUGUST 2000	Priority date (day/month/year) 17 AUGUST 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): A23L 1/015, 1/10, 1/20 and US Cl.: 426/429, 430, 622		
Applicant ARTHUR P. HANSEN		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 5 sheets.
☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).
 These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 16 MARCH 2001	Date of completion of this report 13 DECEMBER 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231	Authorized officer HELEN F. PRATT
Facsimile No. (703) 305-3230	Telephone No. (703) 308-1193

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.:

PCT/US00/20781

I. Basis of the report

1. With regard to the elements of the international application:*

☒ the international application as originally filed☒ the description:

pages 1-9 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

☒ the claims:

pages 10 , as originally filed
pages NONE , as amended (together with any statement) under Article 19
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

☒ the drawings:

pages 1-4 , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

☒ the sequence listing part of the description:

pages NONE , as originally filed
pages NONE , filed with the demand
pages NONE , filed with the letter of _____

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in printed form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

- ☒ the description, pages none
☒ the claims, Nos. none
☒ the drawings, sheets/fig none

5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/20781

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)

Claims	1-10	YES
Claims	11	NO

Inventive Step (IS)

Claims	none	YES
Claims	1-11	NO

Industrial Applicability (IA)

Claims	1-11	YES
Claims	NONE	NO

2. citations and explanations (Rule 70.7)

Claims 1-10 lack an inventive step under PCT Article 33(3) as being obvious over Oughton in view of Moshy.

Oughton discloses a process of treating ground oats with a lower alkanol which can be ethanol (abstract and col. 2, lines 60-70, col. 6, lines 20-54). Claims 1 and 2 differ from the reference in removing the flavors from the oats and in the starting product which is ground oats instead of flour. As the process has been shown, it is seen that the flavor of oats is also removed. Moshy discloses removing flavors from soybean flour using alcohol (col. 4, lines 30-75). No distinction is seen at this time in the use of ground oats instead of flour, as the only difference is in the size of the extracted material. Therefore, it would have been obvious to use the process of Moshy to remove flavors in the instant process because Moshy discloses that alcohol removes flavors and it would also have been obvious to use a more finely ground oat such as flour as the size of the particles is only a matter of degree.

Claim 3 requires the use of elevated temperature and pressures and claim 8 that the extraction is for 20-24 hours. Moshy discloses a process for removing undesirable flavors and odors by the extracting soybeans with ethanol at temperatures of from 75 F. -175 F. (col. 7, lines 40-45, lines 65-70). It would have been obvious to extract for whatever time was required to remove the flavors as in claim 8. It is known that higher extraction temperatures cause the alcohol to become volatile. Certainly, the ethanol will remove flavors whatever the substrate is. Therefore, it would have been obvious to use higher temperatures to remove flavors.

Claim 4 further requires that the flour is vacuum dried. Oughton discloses that the centrifuged flour is dried under a vacuum which would remove any alcohol (col. 6, lines 41-44). Therefore, it would have been obvious to remove alcohol from a material using a vacuum.

Claims 5 and 6 further require that the process is carried out (Continued on Supplemental Sheet.)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

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VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

Claim 8 is objected to under PCT Rule 66.2(a)(v) as lacking clarity under PCT Article 6 because the claim is indefinite for the following reason(s): it is not known what is meant by "elevated temperature and pressure", i. e. how much are the temperatures and pressures elevated from the normal temperatures and pressures.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/20781

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

V. 2. REASONED STATEMENTS - CITATIONS AND EXPLANATIONS (Continued):
continuously or batchwise. The process of Oughton can be used in either a continuous or in a batchwise manner (col. 7, lines 10-35). Therefore, it would have been obvious to process in either manner.

Claim 7 requires that the lipids are removed from the product, filtered and that the alkanol is recycled. Oughton discloses that the lipids (fats) are removed using alcohol (col. 2, lines 54-70).

Claim 9 further requires that the oat flour is "OATRIM". "Oatrim" is a trade name for a particular oat flour. No difference is seen at this time in the use of that flour and the finely divided oats of the reference to Oughton. Therefore, it would have been obvious to use various flours such as "Oatrim", as the removal of the flavors would have been made possible on similar substrates.

Claim 10 is to the product which have been shown to be obvious by the combined references.

Claim 11 lacks novelty under PCT Article 33(2) as being anticipated by Moshy.

Claim 11 requires removing flavors from a soy flour. Moshy discloses removing flavors from soybean flour using a lower alkanol (col. 3, lines 20-35 until the flour is bland.

Claims 1-11 meet the requirements for industrial applicability as defined by PCT Article 33(4) in providing a product and process of removing flavors from oat flour and soybean flour.

----- NEW CITATIONS -----
NONE